Making a Longworth Chuck

by Garrett Lambert

A few years ago I came across an article from WoodTurning.com on something called the *Longworth chuck* and resolved to make one because the idea of a self-contained scrolling set of Cole jaws was just too appealing to resist. I finally got around to it, and was surprised at how simple it is. The cost was a couple of pieces of scrap and $5 for four 5/8" cane tips—buy rubber not vinyl—and four machine screws (¼" x 2½") and a couple of hours in the shop.

The chuck consists of only 2 basic parts, i.e. a pair disks that rotate against each other. Their maximum size is the distance between the centre of the headstock and the bed. You could build one to accommodate larger work, of course, if you turn outboard, but **note** that for an outboard rig the routed curves must go in the **opposite** direction from those described here.

Some preliminary comments:

1. Be very, very careful of the spinning bowl holders on the front and the wing nuts on the back. They hurt. A lot.

2. The chuck works quite well, but with only four holders it isn't designed for heavy side pressure, so take it easy or consider adding two or four more jaws per #3 below.

3. Having made this one, I intend to make two more, one about 10" in diameter for small work, and another of 16". The smaller will just be a miniature of the one displayed here except that I'll use rubber buttons as jaws rather than cane tips for much better access to the workpiece. For the larger chuck, however, I'll make the smallest circle about 5" or 6" in diameter, because a larger inner circle will enable me to have six or even eight arcs and jaws offering far better security. And anyway, as the photo shows, providing for such small bowls on so big a disk is awkward if not plain silly. And, finally,

4. Mr. Leslie Longworth of Australia invented this chuck in the late 1980s and published only the first of a two part an article on it before he died soon after. More info is available at http://www.fholder.com/Woodturning/chuck.htm, including that from which I made the version above.

Time to build. (Believe me, it's important to do the following steps in order.)

My DVR3000 swings 8", so I maximized my chuck at just under 16" in diameter. However, as per Note 3 above, making a pair of chucks, one large and one small, is probably a better choice than a single one-size-fits-all.

I found some 3/4" MDF for the back disk and ¼" Baltic Birch for the front disk.

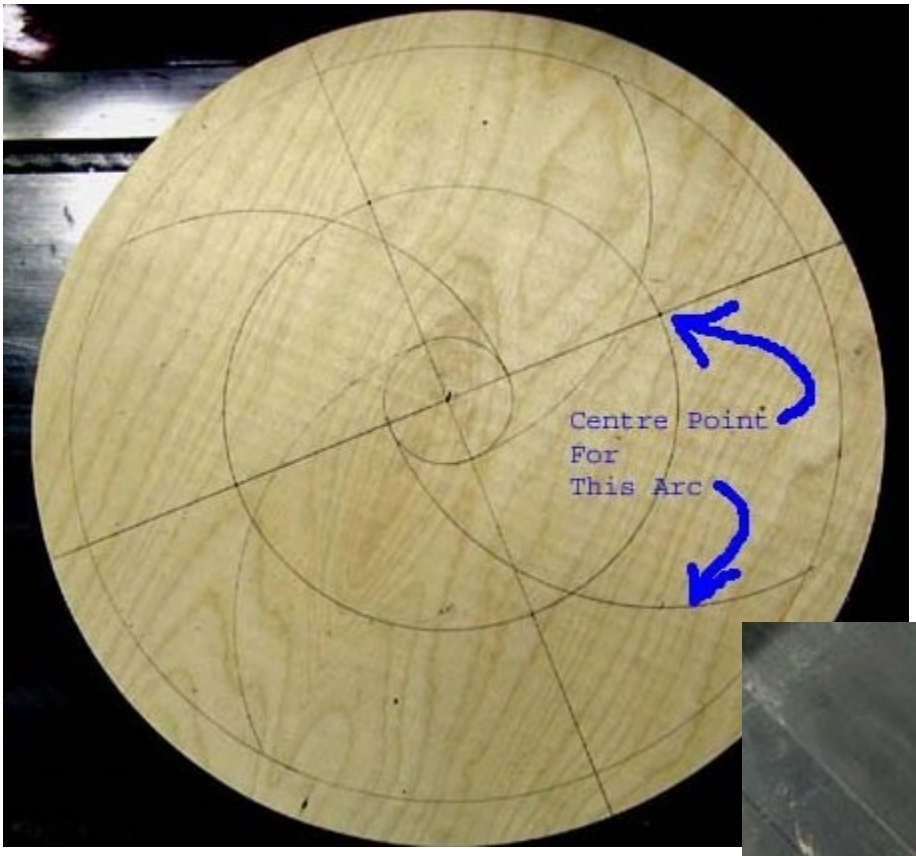
and the bandsaw circle jig quickly turned them into disks.

First, attach a faceplate to the back disk, tack the front disk to the back disk, mo them on the lathe, and true up the edge. Using a drill chuck in the tailstock, drill a small hole through the exact centre of both disks. Draw a registration line across the edges in order to be able to re-align them later if necessary.

You will notice two things in the photo. First, that it shows the routed arcs because I mounted my "faceplate" **after** routing. That mis-step wasted a lot of time getting it centred exactly. Second, it's obviously a nut rather than a faceplate. Some time ago, I found a source for some 1¼" x 8 TPI nuts and bought a bunch, because although it's a standard headstock thread, it's an unusual size in fasteners (pipe thread is 1¼" x 7). I've been using them in various ways to make faceplates and vacuum chucks, and it works very nicely in this application, too.

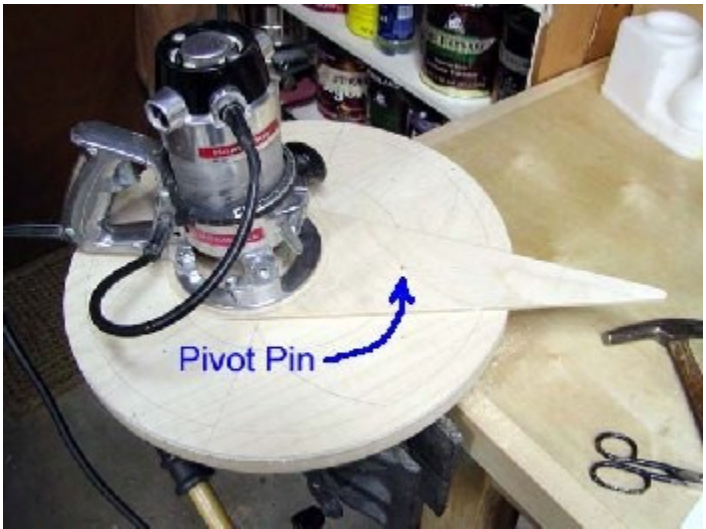
Choose the poorer face of the front disk, and find or make a compass equal to the task. Draw three circles. The smallest is the diameter of your faceplate plus a bit if you're making the small chuck, about 5"-6" if you're making the large chuck. (To add arcs/jaws, divide the centre ring into either six or eight equal segments depending on how many you want.) The biggest circle is about 1" in from the outer edge of the disk, and the middle is, in fact, centered between the other two. Draw perpendicular lines through the disk's centre.

Carefully dimple the intersections of the perpendiculars with the middle ring...



... and use the dimples to centre your compass to draw arcs from the outer ring to the tangent of the inner ring. (These arcs will ensure you make no mistakes while routing.) Make sure the tacks holding the two disks together are well away from the arcs, and mount the disk sandwich in a vise.

If you don't already have one, make a circle cutting base for your router. Drill the dimpled centre points to accept whatever you use as a pin—mine is just a small finishing nail—and carefully rout the arcs through both disks. (Routing MDF makes a **lot** of dust so be prepared!) I made a circle-cutting base out of another scrap of ¼" Baltic Birch, and made the interior hole 3" in diameter to ensure good vision since all start and stop points are done by eye.



The best way to start a cut is to be an inch or so away from an end point, plunge the bit into the work, back up to the start point and then move forward to the end point. With a solid carbide up spiral bit,

only two passes were required to go through both disks (1") but any ¼" straight bit should do.

The result will look something like this, varying according to the diameter of the smallest ring and the number of arcs.

Now drill some 3/4" finger holes around the perimeter of the disk sandwich. These make it much easier to counter-rotate the disks to set the jaws, and eight would be more convenient than just four.

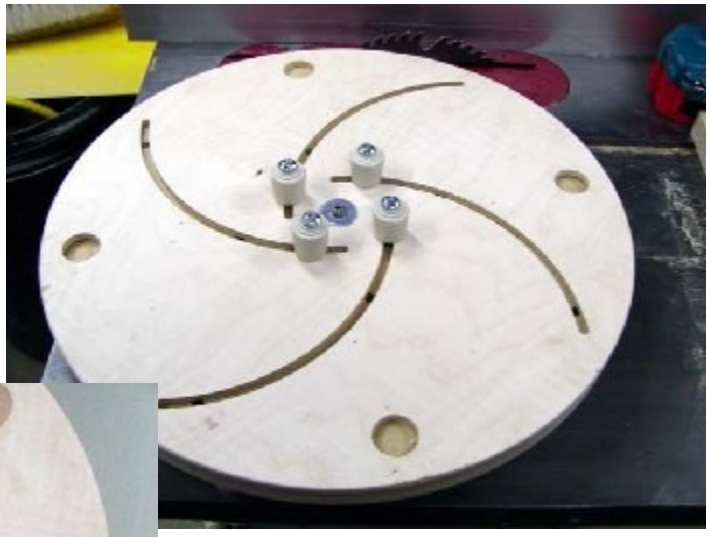
After separating the disks, mount the back disk on the lathe, true up the face, and use some sandpaper to ease the sharp rear edge.

Find a #10 1" round head screw, preferably with an unthreaded shoulder. This screw serves only as an axle, so enlarge the centre hole in the front disk just enough so that the disk can rotate snugly on the shoulder of the screw. Enlarge the centre hole in the back disk to the inside diameter of the screw's thread.

Now, **reverse** the front disk and place it against the back disk so that the routed arcs cross each other. Drive the screw into the centre holes. Back off just enough to allow the front disk to rotate.

Make the jaws. I turned a piece of dowel to 5/8" diameter, cut it to length to fit inside each cane tip, and drilled ¼" holes lengthwise through the top of the tip and the dowel. With the machine screws passing through the arcs, wing nuts and washers on the rear of the back disk make for quick and easy adjustment.

In this photo, I've inserted the jaws. When the nuts are loose, the front disk rotates very easily and synchronizes the movement of the four jaws from the innermost position to the outermost with no effort at all, and can be snugged up at any point to make the whole unit very secure.



In use, as shown in the opening photo at the beginning of this article, it's quite flexible for big (12" bowl) and small (3.5" hollow form) pieces. It's also been pointed out as being a good chuck for truing the glued up rings used in segmented turning.

And best of all, no more having to mount and dismount the jaws on my Super Nova 2 and adjust the eight buttons on the Cole Jaws every time I want to reverse a bowl that I cannot vacuum chuck.